LOCAL COOPERATIVES IN INTEGRATED PEST MANAGEMENT

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PREFACE

This report is a reference work. It is written mainly for those individuals who may help organize a program in integrated pest management (IPM). It should help farmers and managers who are either organizing a new cooperative or starting IPM within an existing cooperative. Also, it should provide a benchmark for measuring future developments.

Two grower-owned organizations' IPM programs were selected for this report. Both serve cotton farmers because the concept has progressed furthest in cotton. One group headquarters in North Carolina, the other in Arizona.

Programs of the two case groups provide differences as well as similarities in operations. As they are among the first organizations to enter the IPM field, their experiences should provide helpful guidelines for others that may enter in the future. These early innovators exhibited foresight and dedication, and their accomplishments have laid a strong foundation on which succeeding workers can build.

Data were obtained through personal interviews with the management and patrons of these two organizations. Additional information was obtained by telephone, correspondence, and a study of company documents and publications. Background information was developed from literature, meetings, and interviews with practitioners in integrated pest management.

Special thanks is owed to management teams of the two cooperating firms —Edgecombe Spray Program, Inc., and Safford Valley Cotton Growers Co-op, Inc., and to their respective State Extension entomologists G. B. Worley, of North Carolina, and Dr. Leon Moore, of Arizona. Special appreciation is extended for support from the U.S. Extension Service, especially Dr. J. M. Good, Director of Pest Management Programs, and P. O. Mohn, economist, and from FCS personnel, especially Dr. J. R. Baarda for legal counsel.

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HIGHLIGHTS

Integrated pest management (IPM) is an increasingly sophisticated system for compatibly using the most suitable and effective controls over crop insects, diseases, weeds, and other pests to hold pest populations below the level of economic injury. The system is built around the surveillance or scouting of crops for pests as a basis for improving control decisions. It began to become a popular concept during the mid-sixties.

How two farmer-owned organizations offer this service on a cooperative basis provides guidelines for other groups wanting similar service.

Safford Valley Cotton Growers Cooperative, Inc., an established ginner in Safford, Ariz., began sponsoring a pest control program for cotton in 1968. Its program features sound cultural practices, a reliance on predatory insects, use of pheromone traps, and aerial application of pesticides.

Edgecombe Spray Program, Inc., of Tarboro, N.C., was initiated by a small group of farmers in 1972 to control boll weevil and bollworms in cotton. This organization, a corporation operated on a cooperative basis, encourages sound cultural practices, and practices diapause control, relies on predatory insects, and sprays on a communitywide basis.

Though adequate documentation is lacking, farmers seem to support these two organizations because IPM means more profits for them. IPM helps these cotton growers with insect protection, yet uses less chemicals than calendar spraying. Edgecombe Spray's program seems to save two sprayings, while Safford Valley's approach may have saved as many as six to eight applications in a single year. These savings mean a lesser problem from secondary pests and a slower buildup in insect resistance to pesticides. Lastly, more profits are possible through group buying. It probably saves at least 10 percent on charges for chemicals and applicator services.

The value of lessened environmental contamination and exposure of humans to pesticides and their residues is obvious.

Safford Valley and Edgecombe Spray represent a wide diversity in types of organizations that can sponsor IPM. Yet both have a common goal of helping farmers combat a key crop pest through group action. They have succeeded by recognizing the seriousness of the threat, by believing that IPM is the best alternative for handling this threat to profitable crop production, and by supplying IPM within a larger pest-control package of services and products.

Sponsors of IPM must have strong legal documentation, principally their articles of incorporation, bylaws, and service contracts offered. These instruments are needed to protect the cooperative and its officers from the consequences of mistakes, especially those related to pesticide application.

Cooperatives should finance their IPM business in a manner most acceptable to their patrons. If a cash basis is used, services should be prepaid—especially where large amounts are involved.

To succeed in IPM, cooperatives should maintain a modern and developing program. They should rely on the Extension Service as one of the most important avenues for innovations.

These and other guidelines in this report can help cooperatives become a major deliverer of integrated pest management to American agriculture. They can be implemented as cooperatives are swept forward into IPM by forces such as a society that demands a healthy environment, by a world that requires greater crop production, and by farmers seeking to curtail the rising costs of production. But cooperatives should do more than react to these forces. They should begin to mold these forces to meet the needs of progressive farmer-owners seeking to adjust to a rapidly changing agriculture.

On the cover: A bollworm penetrating a cotton boll dramatically demonstrates how insects can damage billions of dollars worth of crops each year.

Below, a scout is making one of several hundred sweeps per cotton field with net to determine the count of lygus bugs.

LOCAL COOPERATIVES IN INTEGRATED PEST MANAGEMENT

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Integrated pest management (IPM) became a popular term during the 1960's. The first author remains anonymous but the word integration was used in this context at least a decade ago. In 1959, Stern, Smith, Van den Bosch and Hagen published an article entitled "The Integration of Chemical and Biological Control of the Spotted Alfalfa Aphid."[1]

By 1972, integrated pest management was such a well-established term that a bulletin was published under that title.

Probably the panel of experts convened in 1967 by the Food and Agriculture Organization of the United Nations has provided one of the most succinct definitions of IPM. It is accepted by the Entomological Society of America and reads as follows:

"...a pest management system that in the context of the associated environment and the population dynamics of the pest species, utilizes all suitable techniques and methods in as compatible a manner as possible and maintains the pest populations at levels below those causing economic injury."[2]

IPM was first applied to insects, but is being broadened to include plant diseases, nematodes, and weeds. Increasingly, the disciplines that exist to fight these pests are seeking assistance. Assistance is coming from other disciplines such as agronomy, mathematics, economics, photography, computer science, and telecommunications.

IPM is becoming a sophisticated system. Nevertheless, it is also a service—a service for helping farmers make the most rational and economic decisions regarding the control of pests and the protection of their crops.

Integrated pest management has been defined to include the following elements:

1. Diagnosis of the pest problem. Scouting or "field checking" is a popular means but the term includes pest trapping and other methods.

2. Determination if and when a pest needs to be suppressed. Use of "economic thresholds" is most often used in making this decision. Generally, they are ratios such as numbers of insects or damage per 100 plants, above which the pest will cause an unacceptable yield loss.

3. Suppression of pest. Any combination of several techniques can be coordinated to control a pest, including the judicious use of chemicals. The object of IPM is to hold pest populations below damage levels that are economically acceptable. The object is not to eradicate them. Pest managers usually recommend one or more means of controlling a pest, but they let the farmer decide whether or not he will act on the recommendations.[3]

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[1]Cited in R V R Consultants. Evaluation of Pest Management Programs for Cotton, Peanuts and Tobacco in the United States. p. 107.

[2]Edward H. Glass, Coordinator. Integrated Pest Management: Rationale, Potential, Needs and Implementation. Entomological Society of America. August 1975. p. 14.

[3]Donald L. Vogelsang. It's Time to Consider Integrated Pest Management. Farmer Cooperatives. March 1976. p. 4.

Development of IPM

IPM represents the coordination of pest control techniques, some of which have developed over a period of many years. As early as 1856 Glover reported on the benefits from predator insects in cotton.[4] By 1920, insecticides and early maturing cotton became the hope for boll weevil control.[5]

"Scouting dates back to the arrival of the boll weevil..."[6] which appeared near Brownsville, Tex., in 1892.[7] However, it may have been as late as 1925, guided by Dr. Isely, that the first commercial scout was hired.[8] By 1946, DDT was in general use among cotton farmers[9] while boll weevil resistance was established in 1955.[10]

These are but four of several well-known pest-control techniques established by 1963 when an interest developed in integrating them into a balanced program. To this end, a research program was launched in Mississippi in 1963,[11] while success was reported on this approach in tobacco during 1966.[12]

About this time, interest was such that the Department of Health, Education, and Welfare, a Presidential Science Advisory Committee, and the National Academy of Sciences released several reports.[13]

In 1972, "Integrated Pest Management" was released and an intensive testing program was launched. This program was sponsored by USDA and administered by Extension Service. Extension had funded 71 crop projects by 1975 across 25 States and 15 crops led by cotton, corn, and soybeans. By 1976, USDA had spent $10.5 million dollars on these projects.

IPM is a developing concept with a promising future. Its future appears bright because, one, society demands a reduction in the dangers of pesticides to human health and the environment. Two, farmers continue to seek a cost reduction and yield increase on their crops. Three, the world requires more food. These three forces demand a closer examination of IPM, because it generally helps farmers make a positive response to these forces.

Cooperatives' Role in IPM

The Fillmore Citrus Protective District, of Fillmore, Calif., was organized in 1922. It is a cooperative and one of the few organizations depending mainly on reared, beneficial, predator insects and mites to control most of the citrus pests. It operates three insectaries.

From the early 1960's through 1975, Farmer's Supply Cooperative, AAL., of Greenwood, Miss., offered a scouting service on cotton. Nearly 100,000 acres of cotton were scouted one year.

The Scotland Neck Spray Group in Scotland Neck, N.C., was formed in 1968. Its basic premises were so widely received that seven more groups were organized in the northeastern part of the State by 1974. One of the newer companies was the Edgecombe Spray Group, one of the subjects of this study. All groups fielded scouts, regulated pesticide applications according to insect counts, sought community control, purchased chemicals, and arranged for aerial applications.

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[4]Willard H. Whitcomb. History of Integrated Control as Practiced in Cotton Fields of the South Central United States. Proceedings: Tall Timbers Conference on Ecological Animal Control by Habitat Management. February 26-28, 1970. p. 147.

[5]Ibid., p. 148.

[6]Ibid., p. 151.

[7]Ibid., p. 148.

[8]Edward H. Smith. Implementing Pest Control Strategies. Pest Control and Strategies for the Future. National Academy of Sciences. 1972. p. 53.

[9]Whitcomb, op. cit., p. 149.

[10]Ibid., p. 150.

[11]Ibid., p. 151.

[12]Smith, op. cit., p. 52.

[13]Ibid., p. 47.

Early in 1968 also, a cotton ginning cooperative undertook a pest control program. It was the Safford Valley Cotton Growers Cooperative, of Safford Ariz. During the first year, it placed an excessive reliance on pesticides, but by 1969 began moving into a true IPM program.

Other cooperative gins began sponsoring IPM in California. The first, stimulated by Extension funds, was the Kern Delta Co-op Gin, Inc., of Bakersfield in 1972. Several others followed in 1973 and 1974.

By 1975, sufficient interest had developed in western Kansas to cause managers of three local supply cooperatives to organize a new company in pest management. Servi-Tech, Inc., Dodge City, came into being.

During 1976, Servi-Tech's first full year of operations, it packaged IPM with other crop advisory services, such as: Selecting and timing seedings, soil testing, recommending fertilization rates and timing, establishing irrigation practices, maintaining complete field records, adjusting equipment, and analyzing the quality of crops. Pest management includes recommending controls for insects, weeds, and diseases.

Except for Servi-Tech, most cooperative programs have remained local. Thus, they have contributed to only a minor portion of the total efforts in integrated pest management, except in cotton. Even there it is unlikely that cooperatives and cooperative-type organizations account for more than 10 percent of the acreage scouted by private organizations and individuals in 1976. These organizations probably scouted about 10 percent of the 11.3 million acres of cotton—about the same proportion as that administered through Extension programs.

Future actions by cooperative patrons and management will determine the role of cooperatives in IPM after 1976. These actions will determine the extent to which cooperatives will become involved in delivering integrated pest management to the remaining 8 to 9 million acres of cotton and the millions of acres in other crops.

Almost certainly the combined pressures for a healthy environment and for increased productivity should encourage an adequate review of IPM. The need for this review is heightened by recent observations. Authors from the Council on Environmental Quality noted "...that losses due to insects and diseases in the United States have increased both absolutely and as a percentage of crops value since the 1940's..."[14] Other authors indicate that pests presently destroy one-third of the potential U.S. harvest.[15]

One imperative developed by the Michigan-Kettering conference was to: "Develop Integrated Pest Management Systems for Stable Crop Production at High Levels Suited to Various Styles of Agriculture."[16]

The remainder of this report will examine the operations of two front-runner organizations in IPM: Edgecombe Spray Program, Inc.; and Safford Valley Cotton Growers Co-op, Inc.; then a number of guidelines will be presented based upon these examinations.

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[14]Council on Environmental Quality. Integrated Pest Management. November 1972. p. 2.

[15]Michigan Agricultural Experiment Station and Charles F. Kettering Foundation. Crop Productivity - Research Imperatives. Proceedings from International Conference, October 20-24, 1975. p. 275.

[16]Ibid., p. 3.

More and more aircraft specially designed for pesticide application are being used. Edgecombe Spray Program, Inc., uses an aerial photo map and field markers to help pilots identify the correct fields to be sprayed.

OPERATION OF EDGECOMBE SPRAY PROGRAM, INC.

Edgecombe Spray Program, Inc. (Edgecombe Spray), was incorporated on April 28, 1972. This corporation, which acts as a cooperative, came into being through leadership within the Edgecombe County Extension Service and the county Farm Bureau. Its headquarters are at Tarboro, N.C.

These leaders had observed activities of the spray groups in northeastern North Carolina for at least 2 years before organizing their own company. Eight spray groups operated during 1974 and all were patterned after the first group, which began at Scotland Neck, N.C., in 1968.

Edgecombe Spray was organized, mainly, to achieve "... control of boll weevil and bollworms in cotton ... ."[17] The successful production of cotton, in this area, requires the control of both insects.

Leaders saw the need for areawide control and foresaw the group as a vehicle for achieving the control of these two insects. In addition, they hoped to: (1) lower the purchase price of chemicals through centralized purchasing and bulk delivery, (2) obtain economical aerial spraying through centralized contracting and mass spraying, and (3) minimize the quantity of insecticides used for adequate pest control.

Though Edgecombe Spray was incorporated under general corporation laws, the organization operates on a cooperative basis.[18] First, it is a group of farmers who are associating together to obtain services for themselves, and second, it operates at cost.

Fifty-three farmers contracted for the services of Edgecombe Spray in 1975. They had 3,373 acres of cotton, which was about 800 acres less than in 1972. Program acreage peaked during 1974 with 7,768 acres. This total amounted to about 87 percent[19] of acreage in the area.

Such a high level of participation indicates the degree of user satisfaction with Edgecomb Spray's program. Some growers credit it with yield increases of 50 to 100 percent over their previous programs. These programs often used ground application equipment and neglected cotton in favor of tobacco and peanuts when labor requirements climbed during the late summer.

Services

Edgecombe Spray offers its members a package of services and product for controlling boll weevil and bollworms. The package goes far beyond pest management as a consulting service. It is basically a commitment by Edgecombe Spray to actually assume the total responsibility for preventing two insects from inflicting excessive damage on members' cotton.

Once a member contracts with Edgecombe Spray, the responsibility for making most of the decisions about the control of boll weevil and bollworms passes from him to Edgecombe Spray. Actually, a farmer-member contracts for a specified number of sprayings. He may, however, arrange for additional applications, if willing to incur additional costs.

Edgecombe Spray's package for controlling insects is discussed under four headings: 1) programming controls, 2) procuring chemicals and services, 3) pest management, and 4) pest controls on cotton.

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[17]Grower contract, app. A, p. 1.

[18]For an example of articles of incorporation, see Sample Legal Documents, Part 1 of Legal Phases of Farmer Cooperatives. Information 100. Farmer Cooperative Service, U.S. Department of Agriculture. 1976.

[19]M. C. Ganyard, G. B. Worley, Jr., and T. M. Farmer. A Progressive Community Cotton Insect Pest Management Program. Edgecombe County. 1974. North Carolina State University. p. 3.

Programming Controls

Edgecombe Spray's Insecticide Committee develops the program to achieve control of boll weevil and bollworms. Each year, guided by recommendations of Extension entomologists and past experience, the committee selects the best chemicals for control of pests, projects application rates, and estimates the number of applications per acre.

Early in 1975, the Insecticide Committee estimated 12 applications[20] on 4,000 acres. Acreage was based on members' plans and their observations of neighbors' intentions.

Procuring Chemicals and Services

The Insecticide Committee contracts for chemicals on a bid basis. It circulates a letter inviting bids from several potential suppliers, normally during the last half of March. The letter projects acreage and specifies number of applications, by type of chemical. It also indicates the type of delivery, i.e., 55-gallon drums and 5-gallon cans for small-volume chemicals and bulk tankers for large-volume chemicals. Edgecombe Spray owns two 3,000-gallon tanks for storing chemicals delivered by tank trucks.

Potential suppliers submit written bids to Edgecombe Spray's office, a trailer located at the Tarboro airfield. Generally, suppliers' letters provide guaranteed prices, on a delivered basis, for gallonages stipulated by respondent. Gallonages are based on acreages estimated by the committee.

The Insecticide Committee generally opens bids on or about April 15. Supplier representatives are often present, but no negotiations are allowed. The committee announces the lowest bidder, but not his price. Sometimes there is more than one lowest bidder as each chemical is considered separately.

Edgecombe Spray takes delivery in truckload lots as the manager requests. This type of delivery, plus the direct competive buying of chemicals from formulators probably saves the members of Edgecombe Spray at least 20 percent on the prices they would pay as individuals.

Edgecombe Spray, through its Insecticide Committee, contracts with an aerial applicating service to apply pesticides and defoliants. The contract (app. B) had the following key terms during 1975:

1. Applicator agreed to provide 12 sprayings.
2. Formulation and timing was under direction of Edgecombe Spray.
3. Application charges varied by amount of water applied per acre.
4. Edgecombe Spray lagged payment by two sprayings, but paid upon completion of each satisfactory spraying.
5. Edgecombe Spray had first call on applicator service.
6. Contract could be terminated for unsatisfactory performance.

Edgecombe Spray hires scouts for field surveillance. Both the corporate chairman (the chairman)[21] and members of the Scouting Committee do the hiring.

Pest Management

This term is defined narrowly, at this point, to include the services of insect surveillance and the making of recommendations. Two scouts provided important information to Edgecombe Spray for the control of spraying activities during 1975. Their field observations determined when the application of each insecticide began. They

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[20]Grower contract, op. cit., p. 1.

[21]Corporate chairman is the chief executive officer and is sometimes called president. Any future unmodified reference to chairman will refer to this officer.

monitored the effectiveness of control measures and alerted producers and spray managers to areas needing extra attention.

Scouts measured insect populations in one-half of the fields.[22] These fields were strategically located throughout the county and were the only ones scouted regularly, about every 7 days. This type of scouting was consistent with a community approach to insect control through the regular, blanket, and aerial application of chemicals.

Scouts generally worked singly, but in the same zone as much as possible. They were each expected to survey daily about 28 fields that averaged 12 acres each.

During 1974, a very intensive scouting program was conducted under the full-time leadership of a professional entomologist and partially supported by funds from North Carolina State University and the U.S. Department of Agriculture. Under this program, all fields were scouted individually. Treatments, also, were applied to individual fields, until August 1, when they were shifted to a community basis, applied at 5-day intervals. For more detail, see M. C. Ganyard, op. cit., pp. 19-23.

Scouts filled out a triplicate field report on each cotton field. Edgecombe Spray used a standard form developed by the North Carolina Agricultural Extension Service (app. C). One completed copy was left on the farm in a designated place. Second and third copies were left at the trailer office each morning of the following day. The manager kept one copy and forwarded the extra copy to the Chairman of County Extension Service to help him keep abreast of pest control problems. Edgecombe Spray delegated the training of scouts to the Extension Service, but retained responsibility for their supervision.

Their supervision was subdivided because executives of Edgecombe Spray were limited by available time and the chairman's poor health. The chairman rechecked only a limited number of fields for accuracy of scout reports, but delegated two farmers to spot check in one end of the county. At the same time, two members of the Scouting Committee checked their fields in the opposite end of the county. The chairman also encouraged individual members to check scout activities in their own fields.

The manager made daily field assignments each morning after scouts reported on activities of the previous day. A 6- to 8-day scouting schedule on survey fields was generally maintained. Maintenance of schedule was complicated, however, by aerial sprayings every 4 to 6 days, at least from late July to the last part of August. Avoiding exposure to insecticide was always a prime consideration in scheduling daily scouting activities.

Problems with the scheduling of scouts was reduced through two means. One, the manager used a large wall map to coordinate scoutings with sprayings. The map was a composite of aerial photographs constructed during the preceding year. Numbers identified member fields and pins located scouting activities and fields with insect populations above economic thresholds.[23] Two, the manager used a radio to contact pilots when needed.

Because Edgecombe Spray made preseason decisions on type and rate of chemicals and used a community approach to spraying, scouting became the main in-season element of pest management service.

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[22]Activity was curtailed from 1974 level because the acreage planted to cotton dropped drastically while insecticide prices climbed greatly. These factors were especially important, because scouts did a relatively large amount of traveling.

[23]Levels above which cost of damage exceeds cost of chemical control; for example, when 10 percent of cotton bolls are punctured by boll weevils and when 5 percent of bolls are damaged by bollworms.

Pilots provide an important focal point for all services supplied by Edgecombe Spray. During the 1975 season, pilots flew the following applications:

Number	*Materials*[1]	*Approximate Date*
2	G.	June 20 - July 5
9	6-3	July 20 - Sept. 10
2	G&D	Sept. 11 - Oct. 1

[1]G means guthion; N 6-3 refers to toxaphene-methyl parathion formulation; and G&D means guthion and defoliant.

Insecticides are included with defoliant in the last two sprayings as a diapause control. Their inclusion costs little more than the price of insecticide, but reduces much overwintering of the insects in their diapause or larva stage. Thus, diapause control permits spraying to begin later during the succeeding season and probably saves the grower the cost of two application each year, compared with calendar spraying alone.

The manager gives the pilots daily assignments. They are made from the wall map by number of field. Pilots usually can identify fields from the aerial map, but field markers ensure a correct identification. These markers are placed in each member's field and carry the same numbers as those on the wall map. Signs stand 4 feet tall with block numerals, 6 inches high, on a white background.

Pilots evidence a strong interest in controlling pests. Much of this interest stems from having a common manager with the scouts. The manager has been able to coordinate pest-control activities into a well-integrated unit.

A high degree of integration is evidenced by pilots being able to see the benefits of their efforts. The manager records scouting observations on the same worksheet used to record spraying information (app. D). The chief pilot has final say as to whether or not weather conditions are safe for flying.

Officers and Duties

All officers serve on a voluntary basis. They were originally nominated and confirmed at a membership meeting. Though annual elections are held, officers have usually been sustained each year. All are outstanding farmers or community leaders. The chairman of the Finance Committee is employed by a local bank as a farm manager.

Each officer represents the entire membership of Edgecombe Spray. Geographic location of an officer's home is a secondary criterion for election.

Manager and scouting force are hired employees. The chairman receives a gratuity at end of year, to cover out-of-pocket expenses, but is not considered a hired employee.

The chairman coordinates the work of officers and manager. Table 1 summarizes their responsibilities in 1975.

Committee chairmen also have policymaking responsibilities. Each makes recommendations to the board of directors regarding actions and policies within their respective areas of responsibility. They act on all recommendations coming before the board.

The board of 13 members is composed of the corporate chairman and all committeemen. The board meets twice a year, once during early spring and once during late fall.

In the past, committee chairmen have effected new policies as an executive committee. Such was not the case during 1975, as no formal meetings were held. The chairman relied on contact with individual committeemen.

Table 1—Organizational structure of Edgecombe Spray Program, Inc.

Officer	Number	Duties
Corporate chairman (president)	1	1. Calls and conducts: a. Membership meetings b. Meetings of board and Executive Committee. 2. Coordinates all committee activities. 3. Provides overall management. 4. Promotes well-being of organization.
Scouting Committee:		
Chairman	1	1. Helps screen candidates for business manager, scout supervisor, and scouts. 2. Sees that high quality scouting program is conducted by checking out complaints, talking with scouts, etc. 3. Hires and trains scouts.[1]
Member	1	Assists chairman, especially in field checks of scouts.
Finance Committee:		
Chairman	1	1. Budgets annual charges to members based on inputs from other committees. 2. Collects and holds all receipts for organization. 3. Pays for all products and services. 4. Compiles records and develops annual financial statements of group's activities. 5. Prepares all reports such as that for Internal Revenue Service. 6. Authorizes and records refunds at year's end.
Members	4	Assist chairman in policy decisions.
Insecticide Committee:		
Chairman	1	1. Contacts Extension and resource persons for help in deciding on chemicals to use. 2. Chairs committee during its deliberations. 3. Negotiates with chemical companies and lets contracts. 4. Negotiates with aerial applicators and lets contracts. 5. Decides on timing of aerial applications.
Members	4	1. Decide on composition and rates of formulations. 2. Estimate number of applications. 3. Evaluate and promote diapause program and other pest-management practices.
Manager	1	1. Supervises preparation of field markers at beginning of season. 2. Secures aerial maps. 3. Secures signatures of growers to annual contract at office. 4. Locates and coordinates field markers with grower fields on aerial maps. 5. Acquaints scouts and pilots with aerial maps and fields. 6. Receives and checks daily reports from scouts. 7. Acts as custodian of scouting reports. Forwards copies to county agent. 8. Coordinates daily scouting activities. 9. Receives initial complaints regarding program and transmits to appropriate officer.

[1]Because of other heavy commitments, all employees were hired by the chairman during 1975.

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Table 1—Organizational structure of Edgecombe Spray Program, Inc. —Con't.

Officer	Number	Duties
Manager —Continued		10. Alerts the chairman and pilots to fields with dangerous levels of insect populations. 11. Orders chemicals as needed. 12. Records application data for each member. 13. Calculates refunds and notifies finance chairman. 14. Accounts for field markers as patrons return them to office. 15. Explains refund to patrons at office. 16. Issues refunds signed by finance chairman. 17. Manager is also a half-time employee of the applicator service, and: a. Coordinates application activities. b. Records flying activities, and c. Helps service the planes.
Scout supervisor	1	1. Acts as lead scout; with larger acreage, could supervise 4 to 8 scouts. 2. Maintains high standards in scouting procedures.
Scout	1	1. Scouted about 850 acres weekly during 1975. 2. Makes written reports on each field following each inspection.

Approximate Calendar

During the organizational phase, many meetings were necessary, but by 1975, they had been pared to a minimum. Dates for schedule of activities are approximate for any year, as follows:

March 5	Board of directors meets to plan season's activities.
March 18	Mass meeting of cotton producers is held jointly with meeting sponsored by County Extension Service. Edgecombe Spray begins preliminary signup of participating members.
March 24	Chairman of Pesticides Committee requests bids for forthcoming chemical business.
April 15	Cotton planting begins. Contracts let for chemicals and aerial spraying. Scout recruiting begins. Manager reports for work. Trailer office opens at Tarboro airfield.
May 10	Board of directors meets to finalize plans for season, study program costs, and review grower contract.
May 19	Members receive written notice of deadline on signing spray contract. Payment is specified.
June 1	Scouts report. They work on field markers and other preseason activities.
June 2	Deadline for signing grower contract.
June 5	Mass meeting of membership for final review of spray program. Program is set.
June 9	Scouts are schooled by entomologist from State Extension Service.
June 10	Scouting begins.
July 25	Chairman requests second grower payment.

August 1	Deadline for second payment.
August 30	Scouting ends. Scouts return to school.
October 10	Last defoliant and diapause spraying completed. Freeze sometimes curtails last application.
November 1	Board of Directors meets to review program and approve refund.
November 10	Refunds made from trailer upon receipt of field markers.
November 15	Trailer office closes.

Finances

Edgecombe Spray's original minimum capitalization was $300 from the sale of 60 shares of common stock.[24] Each member must own a minimum of one share to avail himself of the services supplied by Edgecombe Spray.[25] Twenty thousand shares are authorized.

Practically the only source[26] of annual income for Edgecombe Spray has been an annual assessment of members. Assessment is based on expected costs of services and is set by the Finance Committee. It receives per acre charges for chemicals and applications from the Insecticide Committee, which it applies to projected program acreage. Then it adds cost of scouts and overhead charges and divides total by program acreage.

Receipts

During 1975, foregoing calculation yielded an assessment of $52 per acre of cotton.[27] Growers paid this assessment in two installments of $26 each, the first by June 2 and the second by August 1.

Total receipts for 1975 were $176,455, down 58 percent from 1974 (table 2). Acreage

Table 2—Income, expenses, and refunds, Edgecombe Spray Program, Inc. 1972-75

Items	1972	1973	1974	1975
Income	$159,524	$179,816	[1] $424,616	$176,455
Expenses				
Spraying[2]	127,232	171,473	300,244	150,841
Scouting[3]	8,117	6,700	36,064	10,232
Other	1,079	1,355	[4] 8,531	[5] 1,144
Total	136,428	179,528	344,839	162,217
Net income	23,096	288	79,777	14,238
Refunds	23,086	247	79,755	13,837

[1]Amounts include USDA support of $15,040. Of this total, $14,133 covered salaries, per diem, and travel, and $907 bought aerial maps (M.C. Ganyard, op. cit., p. 32).
[2]Includes materials and aerial applications.
[3]Includes social security expenses on scouts and transportation costs.
[4]Includes field markers ($3,895), diesel oil for defoliant ($1,276), tax deposits ($1,291), and aerial photos ($907).
[5]Biggest item is services—legal, repairs, and hauling ($710).

[24]App. B, op. cit., p. 1.
[25]App. A, op. cit., p. 2.
[26]A small amount of interest accumulated on member payments during 1972, and some spraying has been done for nonmembers, reaching $2,100 in 1973.
[27]App. A, p. 1.

declined by the same magnitude because the per acre charge was the same in both years.

The Finance Committee receives payments on assessments, but makes payment the responsibility of each member. The responsibility is his because Edgecombe Spray will not authorize spraying until payment has been made. The organization has a policy of "No pay; No spray!"

Members joining program, for first year of service, pay an additional $1 per acre to help recover the cost of tanks, signs, and other assets purchased during previous years.

Expenses

Spraying costs are the biggest expense—93 percent of the 1975 total. Chemicals comprise three-fifths of this expense. Invoices are paid monthly.

Scouting expenses include all salaries. Scouts are paid weekly, with salary covering labor, transportation, and social security payments.[28] The manager is paid weekly with payments made through the applicator service, which computes social security costs on manager's total salary.

Other expenses include items such as printing costs, office supplies, and an air-conditioner for the office. Material costs of field markers were included in the 1974 amount but labor costs to assemble markers were excluded.

Refunds

At close of year, the board of directors decides on amount of annual refund. Usually, it has approximated the level of net income and, in 1975, totaled $13,837, an average of $4.10 per acre. This refund reduced average grower cost to $47.90 per acre, up 15 percent from 1974 (table 3). The increase stemmed from higher cost of chemicals and 1.5 more applications (13 versus 11.5).

Table 3—Members' annual assessment, net cost, and acreage, Edgecombe Spray Program, Inc., 1972-75

Cost, refund, and acreage	1972	1973	1974	1975
		Per acre values		
Gross annual assessment .	$38.00	$38.00	$52.00	$52.00
Average annual refund....	5.53	— — —	10.27	4.10
Net annual cost.....	32.47	38.00	[1]41.73	47.90
		Acres		
Program acreage.....	4,175	4,670	7,768	3,373

[1]This amount excludes USDA contribution of $15,040, amounting to $1.94 per acre.

Because only a few growers deviated from the overall program, calculation of refund for an individual grower was simple. The following hypothetical calculation is for a grower with 125 acres of cotton.

[28]Edgecombe Spray experimented with a piecework approach in 1974. Scouts were paid $1.50 per field surveyed. See M. C. Ganyard, op. cit. p. 22.

Basic refund at $4.00/A	$500
Allowance for omitting one application at $2.25/A. on 125 acres	281
Charge for 1.4 extra application at $2.65/A. on 175 acres	464
Net refund ($2.54/acre)	$317

Most farmers receive refunds at office trailer. They are picked up by farmers returning their field markers. They often review calculation of refund at this time, but individual member statements are supplied only upon request.

Support

Edgecombe Spray came into being and continues to function largely because of much support from outside which carries no direct cost to the membership.

A past president of the county Farm Bureau was one of the first persons to show an interest in organizing a "spray group." He made facilities available for first meetings where leaders from neighboring organizations came to explain their programs. Leaders, both group and Extension, representing nearby communities at Scotland Neck, Weldon, and Gaston gave freely of their time.

During the organization phase, the chairman of Extension Service in Edgecombe County visited operations in these communities, as did interested farmers.

Since the organization phase, the Extension chairman has continued to wholeheartedly support Edgecombe Spray. For example, during very early spring, all cotton farmers, mostly members of Edgecombe Spray, are invited to a production school. There, the Extension agronomist recommends planting and cultural practices for cotton. At the same time, recommendations are made for the safe application of insecticides by planes, mainly the locating of fields away from people and aerial obstructions. The latter recommendations are especially germane to the members of Edgecombe Spray.

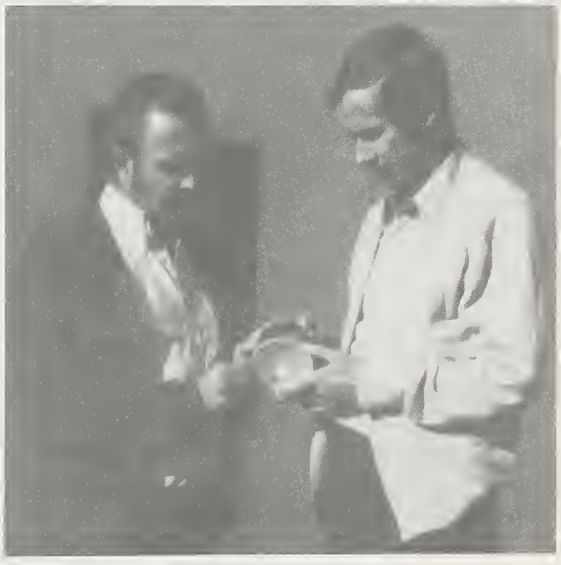
Leaders of Edgecombe Spray are also interested in and guided by pesticidal recommendations made by the Extension entomologist.

During the growing season, the chairman of Extension supports Edgecombe Spray by cooperating with adjacent counties to train personnel for scouting cotton. He also advises on problems in pest management and provides a secretary to type meeting notices, payment requests, and other correspondence by Edgecombe Spray. The company pays for supplies and postage. Moreover, the various meetings for Edgecombe Spray generally center around the Extension building.

Edgecombe Spray is also supported by the North Carolina Cooperative Extension Service. Reference has been made already to input by the Extension entomologist. In addition, he conducts the scouting school mentioned earlier, helps the Insecticide Committee with specific recommendations on pesticide usage, provides some scout and applicator surveillance when in the area, and consults with group leaders and members on special pest-control problems as they develop. He supports an area entomologist who spends a portion of his time in Edgecombe County and is more often involved in actions just mentioned.

Edgecombe Spray benefits from support by the local bank, which allows its farm manager to serve as chairman of the Finance Committee. This means that the bank subsidizes Edgecombe Spray to the extent that the farm manager travels and conducts group business on bank time. The bank also helps when the farm manager consults with bank personnel on tax statements and other matters.

Lastly, Edgecombe Spray enjoys an unusual benefit. It is privileged to have the support of a chairman who remained active following retirement. He has brought special leadership talents developed as the former Extension chairman in Edgecombe County.



In the background of the top picture, two integrated pest management scouts tally their insect population count and prepare to report to the men in the foreground who are members of Safford Valley Cotton Growers Cooperative, Inc. In the left picture below, the count is being analyzed by a pest management specialist with the University of Arizona. In the picture at right, two pest management specialists inspect one of several thousand sex lures being assembled for control of the pink bollworm.

OPERATION OF SAFFORD VALLEY COTTON GROWERS COOPERATIVE, INC.

Safford Valley Cotton Growers Cooperative, Inc., of Safford, Ariz., first became involved with integrated pest management in 1969. Involvement followed an unusually heavy infestation of cotton by the pink bollworm during 1967.

This infestation demonstrated that this insect "can wipe us out" and many growers saw potential yields of 1.5 to 2.0 bales per acre reduced to 0.5 to 0.75 bales. Infestation seared an indelible impression on the minds of these cotton producers.

They reacted sharply They discussed their alarm in pairs and in meetings, then during the Graham County Farmers' Day they took action. Growers appointed a committee of community leaders and the Arizona State entomologist nominated an outstanding grower as chairman. This group came to be known as the Pink Bollworm Committee.

In retrospect, growers in the Safford Valley may have overreacted. During 1968, they went to an areawide blanket-spray program with almost 100 percent participation. Virtually every acre of cotton received 6 aerial applications of insecticides and spray costs soared to $220,000, or $16.59 per acre.[29] Reportedly, at least one plane was in the air almost continuously.

Because all, or practically all, of the growers were members of the Safford Valley Cotton Growers Co-op (Safford Valley), the Pink Bollworm Committee turned to their cooperative for help. It became a vehicle for coordinating and funding the program and for eventually saving 10 to 20 percent on pesticides and applicator charges.

Besides being very expensive, the 1968 blanket-spray program did not eradicate the pink bollworm. Moreover, it caused havoc with the honey industry and precipitated an increased pest pressure from other insects.[30]

Facing these same problems in 1969, the Pink Bollworm Committee sought assistance from the Cooperative Extension Service and the Department of Entomology at the University of Arizona. They assisted by helping to develop a cooperative cotton scouting program. Under it, each field of each participating grower was systematically inspected each week. Per acre program costs dropped 84 percent from the 1968 level.

During the 7 years since 1968, the average per acre cost of the program has exceeded 1968 level only once. This new high occurred in 1973 during a severe outbreak of insects. For all other years, per acre costs were at least 40 percent under the 1968 level, as shown below:

Year	Acres contracted	Total cost	Cost per acre
1968	13,263	$220,000	$16.59
1969	12,750	33,043	2.59
1970	9,655	26,425	2.74
1971	11,051	61,270	5.54
1972	9,069	86,153	9.50
1973	5,487	162,906	29.69
1974	11,076	45,332	4.09
1975	7,634	40,122	5.26
Last 7 years	66,722	455,251	
7-year average	9,532	65,036	6.82

[29]Laurence A. Carruth and Leon Moore. Cotton Scouting and Pesticide Use in Eastern Arizona. Journal of Economic Entomology. February 1973. p. 189.

[30]Ibid., p. 187.

This accomplishment was achieved despite rising wages and chemical costs.

Sixty-three farmers supported the program in 1975 by contracting 7,634 acres of cotton to be scouted.

The program's main objectives are to help cooperating growers protect their cotton yields at minimum cost. Leaders have attained these objectives mostly through field surveillance, which has yielded fewer and less extensive pesticide applications. Leaders have also bargained for lower chemical prices and application charges.

Services

Safford Valley offers its cooperators a package of services that helps farmers lessen their time and concern in making the best pest-control decisions. Having received these services, including several recommendations, each farmer decides what will be done and when to have it done. Services are managed by the Pink Bollworm Committee, or the committee.

Programming Controls

As the name implies, the committee is mainly concerned with the pink bollworm. Conditions and policy have centered pest control activities mainly on this insect, though other insects give problems.

The entire committee discusses the program and, each year, develops a program for the season. They meet frequently, but some of the most important meetings occur during early spring following Graham County's Extension sponsored Farmers' Day. The reason for this timing is that chemical companies send representatives who share up-to-date information about chemical control.

Following Farmers' Day, the committee meets, and with the Extension entomologist present, decides on the chemicals to be used during the following season.

Arrangements with aerial applicators are also discussed.

During the fall of 1975, a significant deviation occurred in the committee's procedures. It decided to advance the use of pheromone traps (sex lures) from an experimental basis and authorized them as a prime means of bollworm control in 1976.

Procuring Chemicals and Services

Following these meetings, the cooperative's general manager drafts and mails letters soliciting written bids from several chemical companies by a given date. The letter identifies chemicals needed, but does not specify quantity.

Since Safford Valley has no storage, offers are based on drum-lot prices delivered to either one of two airports, as needed. Bidding companies often price on quantity used and rebate savings from deliveries that exceed specified amounts.

On the day appointed, the committee meets, usually in the office of the general manager. There, it opens bids and decides on a supplier. The supplier is later notified by the general manager in writing.

Contracts with other suppliers are less formal. Two aerial applicators serve Safford Valley growers and annually agree to common charges for serving these farmers. Charges historically have covered 3- and 5-gallon applications, but only the 3-gallon application was used during 1975.

The contract is oral and binds applicators to serve cooperators as the cooperative directs. Members, however, determine which applicator "flies their cotton" and the final proportion of work done by each. Members also make the final decision regarding level of gallonage in application.

A local pest management company acts as consultant in supplying scouting and other pest-suppressing services. The company's president works closely with the Pink Bollworm Committee and the Extension entomologist to design and improve the com-

mittee's program. His work is based on an oral contract. This company also agreed to manufacture and supply about 40,000 sex lure traps to control the pink bollworm during 1976.

Safford Valley finances member participation in its pest management program. To provide this service, Safford Valley annually budgets this need into its loan request from the district bank for cooperatives.

Pest Management

The contracting pest-management company supplies the scouts each season. Their main responsibility is to keep pest population under surveillance, primarily the pink bollworm. Scouting also helps assure the proper application of chemicals.

The consultant usually hires young men from the university for 13 weeks of work. Six were hired for Safford Valley during 1975, but the number varies with planted acreage of cotton.

Scouting procedures follow almost exactly those suggested by the Extension entomologist. Control is achieved through use of about 50 aerial maps (18 inches × 18 inches) with identifying numbers on each field. Each team carries a smaller (12 inches × 12 inches) similar set of 3 to 12 maps for its respective area.

Scouts survey their fields in pairs, with each pair responsible for about 2,400 acres of cotton. The first pair of scouts may work area A with fields running from A-1 to A-142. Similarly, the second and third pair of scouts will inspect areas B and C, respectively. In this manner, scouting assignments are made until all the fields are covered. The same fields are inspected by the same scouts for the entire summer.

Scouts operate with some latitude. For example, each pair establishes the order in which fields will be visited within their area. Moreover, they have much freedom over time of day in which they work. Due to heat, however, they generally scout during the early morning, often from 5:00 a.m. onward, and during the late afternoon after 3:00 p.m.

Despite this latitude, high-quality scouting is assured by daily evening visits to the company office. These visits afford an opportunity for the supervisor to review the consulting company's written report with scouts and discuss any special conditions existing in their fields.

The company also provides in-field supervision and followup surveys of borderline infestations. This followup, plus spot checks by the supervisor, Extension personnel, and farmers, assures accurate estimates of pest populations.

Scouts are paid weekly, with the person supplying the car receiving an additional weekly consideration. Weekly hours worked and mileage driven varies widely during the season, but wages are not paid by the hour and car expenses are not met through a mileage allowance.

Following each field inspection, a copy of the field report is mailed to the owner, unless a problem exists. If a problem does exist, the grower is advised by either personal visit or telephone. Most likely, the supervisor will also measure insect damage and population before making his recommendations.

Second and third copies of the field report go to the pest management company and to the Extension entomologist. Scout supervisors make all recommendations. A copy of the report is in appendix G.

Besides scouting activities, the pest management consultant encourages the control of insects by two additional methods: 1) destruction of larvae and 2) use of sex lures. The first method includes the destruction and fall plowdown of cotton stalks, often supplemented by a winter application of water to freeze the larvae. This method provides one of the most effective controls, but is so widely used it receives only minor emphasis by the pest management company and the Extension service.

The second additional method, described in the next section, will receive much emphasis during 1976.

Pest Controls on Cotton

Aerial applicators and chemical companies have an important, though reduced, role in the control of cotton pests within the Safford Valley. For example, three-quarters of the cotton received no pesticides over the past 4 years and during 1975 the ratio reached 95 percent. Cotton is not sprayed unless absolutely necessary.

A field is sprayed only upon request by the grower, though the request may be passed either directly to an aerial applicator or through the consultant. Usually, the request is made upon recommendation by the consultant or his field supervisor.

The consultant's field code is important in handling request to spray. The requestor uses code in asking for an application of insecticide. The applicator refers to code on his copy of aerial maps to locate field.

The aerial applicator orders chemicals from supplier if an insufficient quantity is on hand for the latest job. Chemicals are ordered on Safford Valley's account. The farmer is charged an additional amount if he requests a simultaneous application of a chemical not included in agreement between the applicator and Safford Valley.

Under Safford Valley's program, an average of only one-quarter of the cotton acreage has been sprayed over the past 4 years compared with 100 percent in many areas of the Cotton Belt. Stated another way, the average number of applications per acre, under program, has ranged from 8.3 to only 0.3, and has exceeded 3.0 in only one out of 7 years. Program seems to have saved as many as 6 to 8 applications in a single year.

Pheromone (sex lure) or gossyplure traps were supplied by the pest management company in 1976. It became full-scale method with four to five traps placed on each acre of cotton. The consultant maintained traps with pheromone and trapping substance.

Each trap is an inexpensive device designed to attract male moths into a container like those used to package cottage cheese. Once inside, male moths are caught on a sticky substance and prevented from reproducing a succeeding generation of bollworms.

Officers and Duties

Though the pest management effort in the Safford Valley started independently, as noted earlier, it was soon incorporated into activities of the Safford Valley Cotton Growers Co-op.

As soon as activities of the Pink Bollworm Committee became a part of the cooperative's program, its board of directors became an enthusiastic and important element in the pest management program.

The board assumed ultimate responsibility for all policymaking. Actually, the board has allowed the Pink Bollworm Committee great discretion and has been inclined to simply accept policy recommendations of the committee. Even this seems to be done informally. Reportedly, neither a formal meeting nor an official review has ever taken place between the board and the committee. On the other hand, the board exercises an informal control. All new members on the Pink Bollworm Committee are approved by the board before being appointed by the committee.

Moreover, the board controls program expenditures. Examples of this control include its annual review of the loan request for the pest management program. Another example was board approval, in 1975, before the general manager could advance money to obtain sex lures.

The Pink Bollworm Committee is the prime mover of Safford Valley's pest management program. It has eight members, including its chairman. They tend to be younger men and all have an energetic interest in the program.

The committee operates with board approval. It manages the pest management program for Safford Valley. Except as noted later, this leaves the general manager free to devote his full time to ginning operations.

Management includes planning, procuring, and guaranteeing all the services mentioned previously. Because the committee is made up of capable farmers and respected leaders, they have the confidence of cooperative patrons in at least the following areas of decisionmaking and program execution:

—Elements to be included in pest management program, for example, pheromone traps.

—Specific recommendation of pesticides to be applied, including rates of use.

—Source of products and services.

—Price of products and cost of services.

Once the committee has set the program and contracted for needed services it develops grower charges for the season. Charges by the pest management consultant are simply passed on to the growers by entering this amount on their contracts. Charges for aerial sprayings require a simple calculation. Chemical prices are converted to a charge per acre and added to the charge for aerial application. These charges are entered on written contracts for grower signatures (app. E). Safford Valley used a separate contract for sex lures in 1975 (app. F).

Once contracts are ready, the committee undertakes a second important phase of its responsibilities. This phase covers the promotion and public relations aspects of its program. The committee believes in personal contact with patrons, so committeemen divide the work about equally and call on each farmer for his support and contract signature. No mass solicitations by mail or paper are used.

These annual visits also constitute a beneficial effort in public relations. They become a formal way for committeemen to handle criticisms of the program and promote its benefits. After several years, most farmers don't question the program's value; they simply say: "Where do I sign?"

Committeemen generally call upon cotton growers within the geographic area they represent. Safford Valley has been divided into four districts and two committeemen are chosen from each district. Committeemen districts do not correspond to scouting areas. Districts remain constant while areas vary from year to year.

The Pink Bollworm Committee, to a major extent, is a self-determining body, subject to the guidance of the cooperative's board. It feels that eight committeemen is a workable number. Members serve indefinitely and the committee chooses a successor should a member retire or should the committee relieve him of responsibilities. Members feel they know potential successors who will "do the job."

The committee avoids such formalities as subcommittees. It prefers to act as a body. Its members may have strong and opposing views, but they discuss differences until a satisfactory decision is reached.

The committee chooses its own chairman who serves for an indefinite period. The first chairman served 7 years. The chairman calls and presides over all meetings of the committee and coordinates all committee work.

The cooperative's general manager and his office staff provide the Pink Bollworm Committee with much support. While having no vote, he sits with committee, offers his advice where appropriate, and supports the committee by expediting its office work.

Part of this work is secretarial, so the general manager takes minutes of committee meetings and acts as its correspondent, including the solicitation of bids.

The most time-consuming type of manager's support covers the accounting aspects of pest management. He has set up books for all patrons in the pest management program and for each company supplying product and service. Working through the cooperative's accountant, the manager sees that accurate records are kept of pest-management operations.

Approximate Calendar

The following schedule of events, within the Safford Valley, approximate the season's calendar for pest management:

February 10	Pink Bollworm Committee meets. Makes tentative plans for upcoming season. Outlines report for Farmers' Day.
February 20	Farmers' Day is held, sponsored by Graham County Extension Service. Chemical companies send representatives. Committee reviews program of past year and indicates tentative plans. About this time, the pest management specialist begins planning season's activities.
March 1	Committee meets. Makes final selection of pest control measures for season's cotton. Authorizes general manager to solicit bids.
March 15	Committee opens bids and selects chemical supplier. It also approves charges for aerial application and reaffirms agreement with hired pest manager.
April 1	Pest management company begins to organize season's program and to recruit scouts.
April 15	Committee obtains contracts from all program participants.
June 1	Scouts report for training and work.
June 15	First day of grower contract for scouting.
August 10	Safford Valley Cotton Growers Cooperative holds annual meeting, actually on second Tuesday.
September 15	Last day of grower contract for scouting.
October 1	Committee meets to assess season's activities. May make decision for next year, such as approving plan for blanket use of sex lures in 1976.
November and December	Pest management company manufactures sex lures.

General Manager supplies liaison between the committee and the cooperative's board of directors. As secretary, he is knowledgeable about committee activities and meets with board on a regular basis.

Finances

Excepting the cost of office personnel and supplies, Safford Valley's pest management program is totally financed by cooperating cotton growers. Safford Valley simply provides a beneficial accounting and lending service between the time the service is performed and the time farmers pay. Table 4 indicates major expenses for 4 years.

Expenditures

As soon as all farmers have contracted with Safford Valley for pest management services, the pest management company presents its invoice. During 1975, it amounted to $13,823.

The Safford Valley accountant simply divides this amount by 13 weeks to determine the average weekly payment. Thus, during 1975, the consultant was remunerated at the rate of $1,063 per week. From this payment, the consultant was able to meet his weekly obligations, such as the wages of scouts.

Chemical companies submit their invoices monthly and the cooperative pays them shortly thereafter. Aerial applicators are paid weekly.

Cost of sex lures was paid in one lump sum.

Grower Payment

Growers settle their accounts with Safford Valley at season's end. This procedure covers costs of pest control as authorized in the contract between growers and cooperative. Examples of 1975 yearend summaries for two farmers are given below:

Acres and charge	Farmer A	Farmer B
Acres of cotton	277	40
Spraying	0	$674
Scouting ($1.95/A)	$540	$ 78
Trapping ($2.00/A)	$554	$ 80
Total cost	$1,094	$832
Average cost per acre	$3.95	$20.80

Spraying charges to individual growers are computed from acres in each field on applicator invoice and charges on grower's contract. The accountant simply verifies acreage, multiplies contract rate, and debits grower's account.

Prearranged rates for scouting and pheromone traps are applied to each grower's total acreage of cotton. Scouting charges ran 15 cents per acre per inspection during 1975.

All costs to each grower are accumulated through the season and to his account as charges against future receipts from the sale of cotton. These charges, in fact, form a lien against future ginnings and marketings.

Total annual interest charges for the pest management program are given in table 4. They are not included in program costs because some farmers pay cash for services and those that do not could finance services elsewhere.

At end of the year, before a grower's account is settled, the average rate of interest paid by co-op during the preceding growing season is applied to the average amount in each grower's account during the season. As a result, each grower is charged proportionally, according to his use of open-account credit.

Table 4—Expenses of pest management program, Safford Valley Cotton Growers Cooperative, 1972-75

Expenses	1972	1973	1974	1975
Spraying costs[1]	$73,184	$155,100	$26,946	$11,032
Scouting expenses	12,969	7,806	18,386	13,823
Other costs	0	0	0	[2]15,267
Total	86,153	162,906	45,332	40,122
Members' interest charges.	1,285	2,509	3,125	976

[1]Materials and aerial applications. During 1975, materials were $7,572 and applications were $3,460.
[2]Pheromone traps.

The program incurs other costs that are absorbed by the cooperative. For example, time of the general manager and his secretary and accountant is not charged to growers as a pest management cost. Neither is the increase in the premium for liability

insurance due to inclusion of pest management in cooperative's program. Moreover, any discrepancies between the slight gallonage of pesticides bought and applied is absorbed by Safford Valley. Thus, the cooperative slightly subsidizes its pest management program.

Support

Graham county's former Extension agent, now deceased, was a prime mover in organizing the Pink Bollworm Committee and later in encouraging it into a scouting activity. It was during a Farmers' Day gathering that the committee was initially organized.

Farmers' Day is currently used by the present county Extension agent to help cotton growers. Those who attend are exposed to the newest in cotton varieties, cultural practices, and pest-control methods.

The local Extension service has a continuing and specific interest in Safford Valley's pest management program. The county agent publishes a weekly release advising cotton growers of pest conditions throughout Graham county (app. H).

This weekly summary represents a great degree of cooperation between the pest management consultant and the Extension agent. The consultant passes copies of all field reports to the Extension agent. He reviews them and summarizes them by area. They form the basis of his report.

For the privilege of using these field reports, the Extension agent mails them to farmers for the consultant. As a result, each cotton grower can review his situation and immediately compare it with that of all the farmers in the Safford valley.

The county agent also provides the liaison between cotton growers and beekeepers. Since Extension agent knows the fields to be sprayed, he advises affected beekeepers so they can take possible precautionary measures. He often invites beekeepers to the weekly meeting between the Extension entomologist and interested parties from Safford Valley.

This meeting also represents the high-level support that Safford Valley receives, at the State level, from Arizona's Cooperative Extension Service. During this visit, the entomologist meets with all the scouts, discusses program needs, and makes recommendations. Usually, he also makes several stops in fields to observe pest population development and to suggest control where necessary.

Early in the season, these visits provide the opportunity to train new scouts in the identification of insects and the damage they cause. This in-field training is but an extension of the intensive instruction provided, at the beginning of each season, by the Extension entomologist.

These forms of continuing support by the Extension entomologist are built upon the base established in 1969. He has been the program's architect and his efforts then and since demonstrate the degree of support available from State Cooperative Extension Services.

OBSERVATIONS

Despite different insects, varying climatic conditions and deviations in approach, the two organizations described in this report have several things in common:

—Facing the threat of an insect(s) capable of forcing growers out of cotton production.

—Organizing around community-minded farmers to overcome their problems.

—Providing a vehicle for farmers to bargain for lower costs or higher quality of services and products.

—Turning to and relying greatly on support from the Cooperative State Extension Service.

—Eliminating a potential conflict of interest by separating the source of recommended applications from the suppliers of chemicals and their application.

While these organizations have yet to integrate the management of noninsect pests and noncotton crops into their programs, they both provide valuable IPM services for cotton growers. Perhaps Edgecombe Spray and Safford Valley will later build a program more fully embodying the latest and broadest definitions of pest management.

As they exist, however, both organizations seek to maintain insect populations below the levels of economic injury. Both encourage their members to achieve this objective by:

—Practicing cultural controls such as destruction of crop residues to reduce the overwintering of insects.

—Adopting insect-resistant and early-maturing varieties of cotton.

—Placing at least some reliance on natural predator insects to control bollworms and other insect pests. As observed, Safford Valley has implemented this type of control much more fully than Edgecombe Spray.

—Having their fields scouted regularly to measure insect populations, to observe the effectiveness of predator control, and to time pesticide applications.

—Obtaining professional advice concerning control programs and specifications on pesticide applications.

—Procuring chemicals and applicator services on a cooperative basis. This activity, although related to pest suppression, generally is not considered a part of integrated pest management. Nevertheless, both groups perform this service. Thus, they both offer pest management within a package of procurement services.

Moreover, each organization has an additional unique aspect of integrated pest management in its program. Edgecombe Spray practices chemical diapause control. To its fall cotton defoliant, it adds an insecticide to reduce the overwintering of insect pests. On the other hand, Safford Valley uses sex pheromones to lure and destroy male insects, thereby helping to keep a pest population within acceptable bounds.

As a result of these practices, cotton producing patrons of both organizations seem to have increased their profits over those they would have experienced without their programs. Some farmers think programs have increased their yields; others feel programs have lowered their costs of pest control.

Pest managers associated with both programs believe the lessened use of pesticides, especially on the boll weevil, has reduced the buildup of secondary insect pests and lessened the likelihood of insects developing a resistance to chemical controls.

Though Edgecombe Spray and Safford Valley have much in common, variations do exist. Seven are citied below:

—*Insect complexes.* Edgecombe Spray seeks to control boll weevil and the bollworm (Heliothis zea); Safford Valley is mainly concerned with the pink bollworm (Pectinophora gossypiella) but Lygus bugs, the bollworm, and other insects cause occasional problems.

—*Organizational purposes.* Edgecombe Spray's sole current objective is insect control. Safford Valley's main purpose is cotton ginning; however, insect control is an important secondary activity provided.

—*Organizational structure.* Edgecombe Spray is a regular corporation operated on a nonprofit basis. Safford Valley is a cooperative corporation.

—*Board involvement.* The board of directors of Edgecombe Spray is directly involved and responsible for day-to-day operations, which are only partially delegated to a part-time manager. Directors of Safford Valley only review policies of its Pink Bollworm Committee. This committee in turn, is mainly a policymaking body that has delegated most operating matters to its hired pest-management consultant.

—*Program responsibility and risks.* Edgecombe Spray takes total responsibility for controlling boll weevil and bollworms in its members' cotton. To this end, it provides a complete package of services. Safford Valley, on the other hand, approaches this degree

of responsibility only with its sex-lure traps. Each member retains final control over whether or not he will spray insecticides and which applicator will do the work.

—*Scouting.* Edgecombe Spray scouts about half of its members' fields in managing its community spray program. Safford Valley scouts all fields, but makes recommendations on individual fields and infestations.

—*Financial aspects.* Edgecombe Spray budgets and requires preseason payments from members. Thus, it operates on a cash basis. Safford Valley advances credit to its members for the cost of pest control, which is settled after cotton is harvested and ginned.

Because preseason payments have generally been more than adequate, Edgecombe Spray, the general corporation, usually pays an annual refund, while the Safford Valley cooperative has made no refunds on its "at-cost" pest management program.

GUIDELINES

Based mostly on the experience of the cooperatives in this study, general suggestions seem in order—especially for farmers interested in establishing services on a cooperative basis. They are peculiar to pest management.

One, farmer leaders who recognize the threat of pests to their crops, and the potential hazard of pesticides to their environment, should take preventive actions before major and costly problems occur.

Two, they should initiate a program if enough farmers are willing to commit a sufficient acreage to require the need of at least two scouts. These scouts should be able to handle about 2,000 acres, but State Extension specialists can advise more closely.

Three, a new organization will be most successful if it can build on a community of interest and a past experience of cooperative effort. For example, efforts by the Pink Bollworm Committee have succeeded partly because of its geographic isolation and the past success of Safford Valley. Need, common interest, and achievement are other unifying forces that can help a new organization succeed.

Four, if a group of farm leaders wish to organize a pest-management service, they may wish to approach an existing cooperative, either local or regional, and build on its experience and capabilities.

Five, if an existing cooperative decides to provide a pest-management service, its directors should be sure the cooperative's bylaws are written with sufficient breadth to accommodate the new service, and that its bylaws and service contracts contain provisions for limiting the liability of the cooperative and its officers.

Six, if these farm leaders decide the best approach is through an independent organization, they should consider a cooperative structure to implement operation-at-cost and equitable treatment concepts.

Remaining guidelines are presented below.

Services

A new or existing cooperative that decides to provide integrated pest management can supply varying amounts of services and products. Generally speaking it should start with the maximum amount within its management, IPM-proficiency, and financial capabilities.

Ordinarily, the degree of an organization's responsibility will increase as number of services rises. Only supplying fieldmen to recommend insecticide usage results in the assumption of minimal responsibility. As an organization begins making recommendations for weeds, disease, etc.; and as it begins directing aerial applicators, each step brings it to succesively greater levels of responsibility. Finally, if it begins deciding when each pest-control technique is used, it will assume a maximum level of

responsibility, and should be prepared to accept it. Farmers will expect the cooperative to protect their crops from pests to the degree specified in their contracts.

Because of the risks inherent, especially with the greater magnitudes of responsibility, a new organization should be guided by the most proficient professional pest manager attainable, who can put the new program on sound technical ground. Extension professionals often can assist up to the limit of time available. (See section on support.) Employment of a professionally trained pest manager becomes essential as a cooperative grows.

Programming Controls

Considerable foresight is necessary in planning a season's program. Definite and detailed plans should be completed well in advance of time for implementation. For example, allow sufficient time to recruit and train field scouts.

Procuring Chemicals and Services

Procurement of all chemicals and services should be on a bid basis, unless the local cooperative is a member of a wholesale cooperative. This procedure encourages fairness. Written letters of solicitation enhance the process because requirements such as container, form of delivery, and quantity can be stated explicitly.

Bid prices should be written and forwarded in a sealed envelope, and no negotiation should be allowed after bids are opened. Acceptance of a bid should be made or confirmed in writing. Written contracts with companies supplying services such as scouting and aerial application should be sufficiently detailed to cover any foreseeable difficulties that might arise. Appendix B exemplifies a contract with much detail.

Pest Management

Narrowly defined, pest management is the precise pest surveillance and the making of recommendations for controlling pests. Accurate surveillance and timely recommendations are prime cornerstones of any pest management program.

Surveillance, at the present time, is practically synonomous with scouting—field inspection by young people. They should be used until a better approach is developed, or the need for them is eliminated. For example, in the future, computerized models utilizing weather data and the limited monitoring of crops will greatly reduce the need for intensive scouting.

Accurate surveillance depends on the scout's ability, his temperament, his training, his job demands, and his supervision. Cooperative management must screen applicants carefully, based on guidance from experienced pest managers, frequently with the help of the State Extension pest manager.

Prevent excessive demands on scouts, especially during the growing program. Such demands can develop from a failure to recognize variations in geography, type of crop, and type of pest.

High-quality scouting often depends on high-quality supervision. Without the latter, some scouts will develop poor work habits; with it both their enthusiasm and quality of work can be maintained. Both aspects are helped by: 1) daily reporting and consulting, 2) daily in-field contact, 3) checking of scouting reports, 4) anticipation of a possible buildup in pest populations, and 5) use of field maps. See appendices C, D, and G for forms used by Edgecombe Spray and Safford Valley.

The pest manager should recommend pest-control actions within 24 hours after a problem is identified. Usually, this also means that the manager will have inspected the trouble spot during this time.

For long-term success in pest management, a sponsoring cooperative probably should offer this service in a larger patron package. This package can contain services

only, like the crop-advisory package of Servi-Tech, or it can be a service-product package similar to those of this study's two organizations.

Pest Control

Pest control often is more than the application of pesticides. For example, the use of pheromone traps and the release of laboratory-produced predator insects have proven successful in some parts of the United States.

The aerial application of chemicals should be considered, as inherent advantages are increasing its acceptance yearly. Nevertheless, care should be exercised by choosing a reputable firm and contracting with one that can completely serve the needs of a cooperative's patrons.

Once an applicator has been retained, cooperative management should institute controls to assure high-quality performance. One control might be the use of well-designed, maintenance-free field markers. A second control might require that cooperative personnel supervise the receipt of all chemicals. The consumption of pesticides shown on invoices could be measured, and then be compared to gallonages applied.

Finances

Any organization or group of farmers attempting to provide integrated pest management services must develop them on a sound financial foundation. Most of the succeeding suggestions will apply to capitalization, receipts, expenditures, and refunds.

Capitalization

Corporation law in some States may specify a minimum amount of capital required for incorporation which may or may not be sufficient to organize a particular cooperative. A group of producers may be able to raise needed capital through the sale of stock or membership fee only. Or they may decide to go beyond this amount and require an additional minimal levy or assessment, say $1 on each acre assigned to the program. Much depends on the number of services to be provided and on the support available from would-be users. One organization might capitalize for as little as $2,500, but another for several times this amount.

Financing pest management with many services by an existing cooperative could require much more capital. Funds might be needed for equipment, materials, salaries, travel, office charges, and promotional costs. Over a 2- to 3-year period, until established, a program could easily require up to $100,000, excluding the cost of buying and applying pesticides.

Handling Receipts

A cooperative may choose to function on a cash basis as done by Edgecombe Spray if capital is limited. This approach almost certainly requires prepayment for services and a very firm requirement that payments are received before service begins. This requirement grows in importance as costs become higher. Thus, Edgecombe Spray has a policy of "No pay; no spray!"

Prepayment should be high enough to cover all anticipated costs based on a pro-forma budget. Usually salaries and other overhead costs can be converted to per acre charges. If the cooperative assumes the responsibility for pesticide application, rates and number of applications often can be projected fairly accurately. Also, it should anticipate finance charges, liability insurance, and a reserve for contingencies.

Established firms may wish to allow some credit on services performed and products supplied. They may even go the limit and extend credit to cover all pest-control needs for an entire season. In this case, they will most likely, as with Safford Valley, have an arrangement whereby payment is guaranteed at harvesttime. Safford Valley

farmers are obligated to gin cotton with their cooperative and to pay their pest-control bills at harvest.

Other suppliers of integrated pest management may follow an intermediate course by requiring two or three payments during the season. The first would be a prepayment at time growers sign up for the program while the last would be paid at end of season. Most likely, any "in-season" payment would be made on a prepaid basis. In any case, postpayments could be handled under standard practices used in collecting credit.

Annual payments may fluctuate too widely if expenditures for costly capital items are such as cars and storage tanks are paid for during the season. Therefore, to avert such fluctuations and to fairly price its services, organizations may wish to use annual depreciation on capital items.

Paying Charges

Payment for chemicals should follow industry practices, probably on a monthly basis. All employees and aerial applicators usually are paid weekly.

Some lag generally follows the performance of a service, but with aerial applicators a delay of 2 weeks or two applications gives time for complaints to be registered and remedied.

A complete accounting of all costs is advisable. While this suggestion may seem obvious, established cooperatives can easily slip into the practice of providing too much free service. Office facilities can be provided, employees can give time, and supplies can be used in appreciable amounts before attention is given to charging their full use to pest management.

Making Refunds of Prepayments

Regardless of product supplied or service performed, cooperatives operate essentially on an at-cost basis by distributing yearend net margins to members or patronage refunds to patrons. Usually, a cooperative's legal papers bind it to do so. The directors of a well-managed cooperative will seek to increase its patrons' profits by supplying products and services at the lowest cost feasible, after refunds.

Payment of specific refunds on the IPM services is desirable. It allows patrons to know exactly what IPM costs them—a very important consideration during the early phases of a new service.

Calculation of refunds on pest management can be made to each patron on his contribution to the net savings of the cooperative. For example, assume a cooperative received a prepayment of $40 per acre on 10,000 acres ($400,000) planning on 10 aerial applications, or 100,000 acres at $4 each. Assume further that the cooperative actually flew an average of 9 applications, yielding a savings of $40,000. During the same season, however, one farmer's fields of 100 acres received only 6 applications. Therefore, this farmer should receive a relatively greater refund, i.e., $16 per acre or $1,600 in total.

Support

Managers of successful pest management programs aim to operate so as to warrant strong support from their members and to obtain maximum support from outside sources, especially from State Extension Services.

Membership Support

Initially, a new organization may have strong membership support because the activity is new and benefits may be readily measured. As the organization grows older, however, activities become accepted and routine, and interest can fall.

To maintain strong membership support or convert nonmembers who try to copy a cooperative's program, the following suggestions are made:

1. Seek to maintain initial interest by keeping the program modern. Keep abreast of improved pest management techniques as they are developed and be willing to adopt them as soon as they are recommended by the State Extension Service and other reliable sources.
2. Obtain new and younger leadership who can bring fresh approaches. Provisions should be made to attract, train, and empower young men on the boards of directors and advisory committees. Such committees should function locally and bring new ideas to the cooperative through frequent contacts with patrons.
3. Renew patron signatures on annual contracts and foster good membership support through personal visits by directors and committeemen. These visits express an interest in the farmer and allow him to express views he might hesitate to bring up in membership meetings.
4. Make the most of the annual membership meeting. Often it can be held in conjunction with a county Extension meeting. At this time Extension personnel can present useful marketing and agronomic information, while cooperative leaders can explain their program and conduct their business.
5. Let each farmer know how his pest problems compare with those of his neighbors. This comparison can be attached to his individual scouting report in the form of a newsletter. If the member has a serious infestation, however, he would certainly expect and receive much more personal attention.
6. Supply each grower with a summary of his activities in integrated pest management, at the close of the season, including costs and amount of refund, if any.
7. Document and circulate the benefits from pest management among nonparticipating farmers.

Extension Service Support

All groups and organizations interested in implementing a program in integrated pest management should contact Extension representatives. Management of large and established cooperatives would want to work with State leaders. Interested farmers or farmer groups would normally contact their local Extension chairman.

The county Extension chairman has or can obtain information to assist in deciding whether or not to initiate a program in pest management. If the decision is affirmative, he can help leaders develop plans for organizing and initiating the service. At an appropriate point, he will contact State Extension leaders for their assistance. Also, he can often assist in training scouts, advise on pest identification and control, and help with program support. Examples of support include the annual production school in Edgecombe County and the weekly pest conditions report in Graham County (app. H).

Most States have an Extension economist in the field of business organization or management. He can offer valuable and specific guidance, especially during the initial phases of an organizational effort.

At the same time, it may be appropriate to contact Extension entomologists, plant pathologists, nematologists, and other pest management specialists at the State level. The particular specialist will depend 1) on the predominant need within organization's area and 2) on the discipline exercising the greatest leadership in pest management. To date it has usually been entomologists.

These specialists can be an organization's prime contacts in universities where great expertise exists and much forward-looking research is in progress.

Extension specialists in pest management have recommended control programs which usually should be incorporated into a cooperative's program. If they do not apply, the specialists can often tailor recommendations to specific problems. Moreover,

they often 1) assist in recruiting qualified scouts; 2) provide guidelines and set up schools for training scouts; 3) are available for helping with urgent pest problems 4) provide access to the latest findings from research; and 5) cooperate on programs designed to support integrated pest management. These programs range from computerized mathematical models to sophisticated telecommunications systems. They can be very valuable services for any cooperative deeply involved in integrated pest management.

Legal Considerations

Most farmer cooperatives are incorporated under State "agricultural cooperative" or "cooperative marketing" statutes. Incorporation has a number of advantages including the limitation of liability of members or stockholders to the amount of their equity in the association.

A group of producers intending to form an incorporated cooperative should consult the applicable State statute and retain an attorney who is knowledgable about cooperatives to assist them with its organization. The attorney should be retained by the committee designated to implement the organization.

Legal relationships pertaining to objectives, membership, powers, capital structure, and those dealing with responsibilities of members, directors, and managers should be set forth in well written legal documents. These consist mainly of the articles of incorporation and bylaws, but include member application, membership or stock certificate, and service contract. They must be fully understood by those responsible for the cooperative's operation and those comprising its membership.

Articles of incorporation state the purpose and scope of the business and must conform with laws of the appropriate State or States in which a cooperative plans to do business. Articles should define a cooperative's purposes broadly enough to allow for the later adding of services (see app. B).[31] Directors and managers of existing cooperatives should review their articles to be sure they are authorized to supply pest-management services.

Bylaws are a relatively detailed set of rules that govern the operation of the cooperatives. They are written in conjunction with the articles, and specify such procedures as: the requirements and responsibilities of members; the powers, terms, and election of cooperative directors and officers; the financial structure of the cooperative; and the methods of financing the cooperative and handling money that flows through it.

Bylaws will usually contain two features peculiar to cooperative operation. Member control of the cooperative is provided by voting procedures—usually but not always, one vote per member. Bylaw provisions will also specify that the cooperative provide its services to members at cost.

An additional provision, in the bylaws, may be needed to avoid conflict of interest where the cooperative acts both as a consultant to members and as the supplier of their materials. Organizational and administrative procedures may also be necessary to avoid claims that recommendations are overstated to increase chemicals sales.

A membership application states the desire of an applicant to become a cooperative member and provides space for acceptance signatures by cooperative officers.

A membership or stock certificate simply evidences a patron's acceptance into an association and indicates he has certain rights, privileges, and benefits. It should be viewed as a commitment by both patron and cooperative to abide by the cooperative's articles and bylaws. Inclusion of a phrase limiting a patron's legal action against cooperative officers is recommended for organizations specializing in pest management.

Service contracts define the rights and duties of cooperatives in providing inte-

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[31]For a general example, see Sample Legal Documents, a part of Legal Phases of Farmer Cooperatives. Information 100. Farmer Cooperative Service, U.S. Department of Agriculture, 1976.

grated pest management services to their members, and define the obligations of the member toward the cooperative. These contracts should be as simple as possible, yet cover all important topics of agreement (see app. E).

Among other items, the service contracts should: 1) specify any unique features of service supplied, 2) define terms of payment, and 3) describe special grower obligations such as planting crops at a safe distance from residences.

The contract may also contain provisions for limitation of liability if the cooperative's programs do not work out. It would disclaim responsibility for improper services resulting from "good faith" mistakes and protect the cooperative from attempts to make it guarantee the success of its programs. This provision, combined with a careful contractual description of what the cooperative agrees to do and what it does not agree to do, is the first defense against claims for unsatisfactory services.

Three methods of protecting the cooperative and its officers and directors include: 1) the requirement of performance bonds on all suppliers of services such as aerial applicators, 2) keeping an adequate level of liability insurance, and 3) putting an indemnification clause in the cooperative's bylaws. This clause would promise to reimburse cooperative officers and directors for court judgments suffered because of "good faith" mistakes made while representing the organization.

Lastly, written contracts are recommended with suppliers. While an organization may function successfully for a time without them, preventable misunderstandings can develop.

The contract should be simple. On the other hand it should contain all the terms of the transaction. Therefore, it can become rather long, as in appendix B.

Officers and Duties

The control of pest-management programs properly resides with patron farmer members who elect a board of directors that sets policy and makes ultimate decisions.[32]

Recruiting from 7 to 13 knowledgeable, energetic, and dedicated farmers to serve on a new board of directors may be challenging. Recruitment problems may be eased if member responsibilities can be limited to policymaking duties and administrative functions can be excluded.

Bylaws should provide for the election of about one-third of the directors each year with 3-year terms suggested. This procedure encourages the continuing presence of experienced leadership.

Nominations should be made by a nominating committee selected by the board of directors and by the membership, within provisions established for geographic representativeness. Members should seek a board with members well-balanced between youth and experience. The board should select its chairman.

Board directors have the responsibility for making a pest-management program succeed. They should establish objectives and policies, and make long-range plans for services, facilities, and finances of the organization.

Two of the most important board decisions will be 1) whether or not to hire a full-time program manager, and 2) which candidate is the best qualified. These decisions come easier if a highly qualified candidate is available, such as a vigorous but early-retired county agent or an experienced college graduate trained in pest management.

Though sometimes impossible because of limited finances, a suggested approach is the hiring of a full-time pest management specialist to act as a program manager and if the program is of sufficient size, he should hire one or more scout supervisors—usually one supervisor for each four to eight scouts.

The organizations described in this report, however, represent at least two compromises with this suggested approach. *One*, a high degree of dedication and camaraderie

[32]For detailed informtion, see Irwin W. Rust. *How to Start a Cooperative*, Educational Circular 18. Farmer Cooperative Service, U.S. Department of Agriculture. 1965: 18 pp.

allows Safford Valley's Pink Bollworm Committee to function as a program manager. *Two*, while Edgecombe Spray's board of directors operates its program directly, its manager provides much help in accounting and coordinating, but little assistance in the technical aspects of the program. He functions partly as a program manager in nontechnical areas, and partly as a scouting supervisor.

If a pest-management cooperative cannot afford full-time employees, its board of directors may assume direct control of all activities. But, to do so, it must subdivide responsibility, as with Edgecombe Spray. Moreover, it should expedite actions leading to the early hiring of a professional program manager.

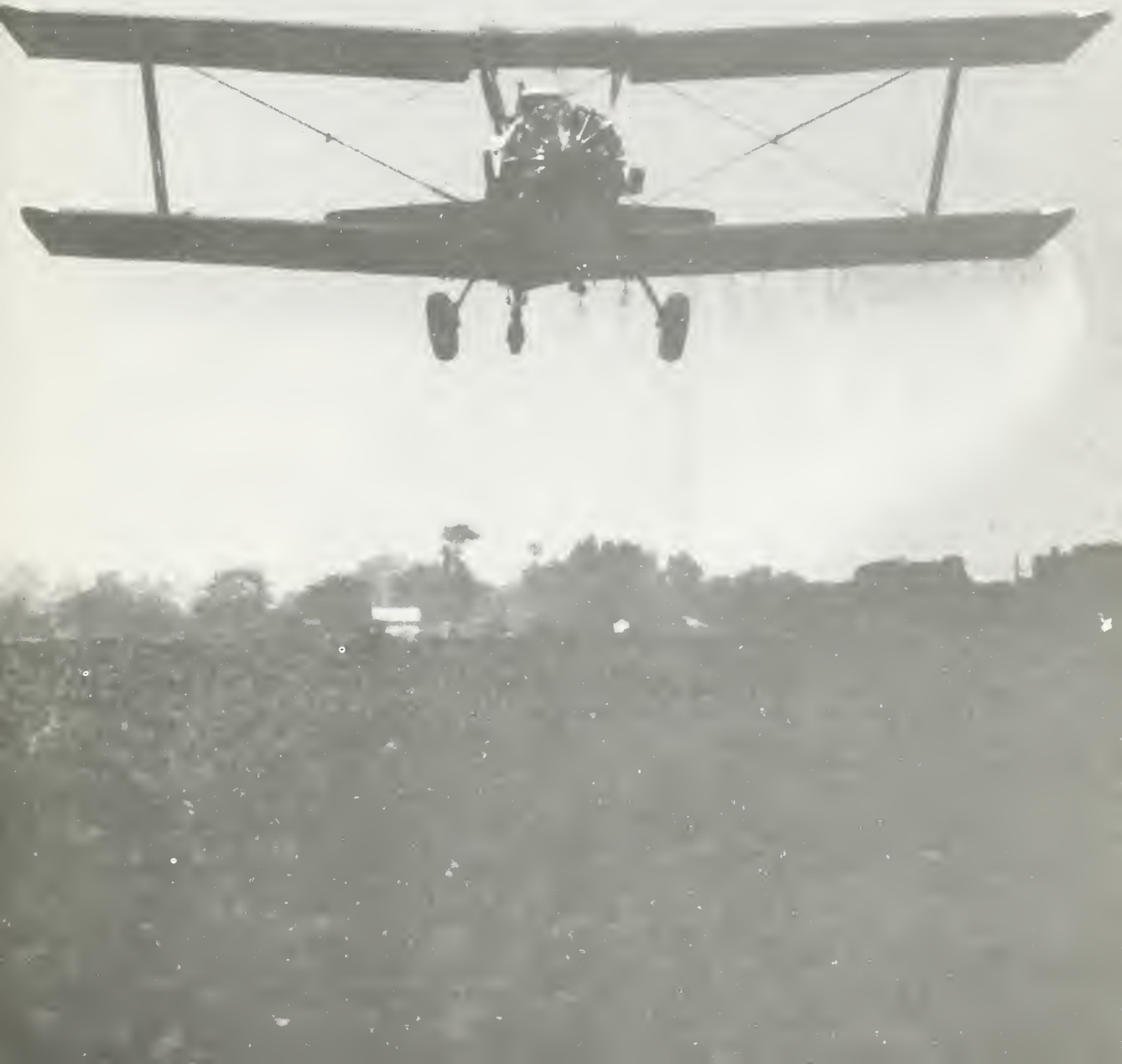
The manager's responsibilities include the following:

1. Development and administration of programs to carry out board policies.
2. Preparation of financial budget and reports.
3. Implementation of appropriate accounting records and procedures.
4. Hiring and supervision of the type and number of necessary employees, including part-time persons and a consultant scouting supervisor, if these alternatives are desirable.
5. Maintaining positive member relations and a high degree of member participation. This responsibility requires much contact with farmers, a timely and accurate handling of patronage refunds, and the employment of proficient and diligent scouts.
6. Guaranteeing accurate, timely, and meaningful field reports on pest populations to members.
7. Maintaining productive working relationships with pest management specialists at universities, especially specialists in the Cooperative Extension Service.

Beyond these basic functions, the manager's responsibilities could be extended if the board decided to include application of chemical controls. Then, added responsibilities could include the following:

1. Determining the best types of pesticides and rates of application.
2. Soliciting and selecting the best bid from pesticide suppliers and applicators.
3. Ordering and receiving chemicals.
4. Supervising application of chemicals and use of other pest controls to assure that they are properly used.

APPENDIX CONTENTS



APPENDIX A GROWER CONTRACT (EDGECOMBE SPRAY)

STATE OF NORTH CAROLINA
COUNTY OF EDGECOMBE

THIS AGREEMENT, made and entered into this _____ day of _____, 19___, by and between _____
(Name and Address)
hereinafter referred to as "The Farmer," and The Edgecombe Spray Program, Inc., hereinafter referred to as "Edgecombe Spray."

WITNESSETH:

THAT WHEREAS, Edgecombe Spray has submitted to The Farmer a proposal, the purpose of which is to provide control of boll weevil and boll worms in cotton; and

WHEREAS, the proposal anticipates approximately ten (10) applications of regular season spray with the addition of two (2) sprays of defoliant mixed with pesticide, to be applied by planes contracted for and with AG-AIR, INC., of Rocky Mount, N. C.;

WHEREAS, this proposal seeks lower cost of application through the concept of community application; and

WHEREAS, the parties hereto desire to reduce the terms of this agreement to writing;

NOW, THEREFORE, for and in consideration of the mutual promises to each other, as hereinafter set forth, and for other valuable consideration, the parties hereto do mutually agree as follows:

1. Upon appropriate contract provisions with AG-AIR, INC., or other suitable airlines, Edgecombe Spray will provide up to ten (10) applications of regular season spray plus two (2) sprays of defoliant mixed with pesticide.

2. Formulations and schedules of spray will be determined by the age and infestation of the cotton, and will be determined primarily upon information obtained from current scouting reports and upon recommendations of the Extension Service but in all cases shall be the sole determination of Edgecombe Spray.

3. In the event The Farmer desires additional flights or chemicals, any additional flights or chemicals shall be at the Farmer's own expense upon agreement with the management of Edgecombe Spray and AG-AIR, INC., or other determined airlines.

4. In the event a flight and spray is not satisfactory, the Farmer shall have the right to request a ground check for absence of chemical or high insect population. Said request shall be made within three (3) days of the last application. Time is of the essence and any field having no complaint within three (3) days shall be deemed to have had satisfactory coverage. In the event said request is made and it is determined that there is unsatisfactory coverage, a flight will be repeated with the charge for pesticide to be assumed by Edgecombe Spray, provided however that no repeat flight will be made free of charge in any field having restrictive barriers.

5. The Farmer shall have the sole responsibility of planting cotton only where it is accessible to aircraft.

6. The Farmer by his acceptance of this contract agrees to become a member of the Edgecombe Spray Program, Inc., and hereby agrees to purchase a minimum of one share of stock in the Corporation at a cost of Five Dollars ($5.00).

7. The Farmer agrees to pay to Edgecombe Spray as costs of the spray program for cotton insect control the sum of _____ per acre for the year 19___, provided,

however, that in the event the Farmer is a member of the spray program for the first time as of the date of this contract, said Farmer shall pay the sum of _____ per acre for the first year in which said Farmer is a member.

Said payment shall be made in two parts, with one-half of the total payment becoming due and payable May 15, and the remaining one-half becoming due and payable on July 15, 19___. No pesticides will be applied for anyone until payments have been received.

8. Insecticide will be used according to manufacturer's recommendations and subject to manufacturer's reservations as stated on each label.

9. In the event the program can be satisfactorily completed with less than the required applications with less cost involved, any excess money shall be returned to the Farmer based upon the services rendered to said Farmer as recorded in the Corporation records.

10. In the event that the total sums received by Edgecombe Spray are exhausted before the insects are eliminated for the season, said Farmer will be given the opportunity to extend his treatments for an additional sum to be determined by Edgecombe Spray.

11. The Farmer by his acceptance of this agreement and by his signature hereon hereby relieves and holds harmless Edgecombe Spray and any member of Edgecombe Spray or any designated agents thereof for any and all financial responsibility resulting from the failure of said Farmer to produce his expected goal of cotton.

It is agreed between the parties hereto that the place of this contract, its status and forum, shall be Edgecombe County, North Carolina, and in said County and State shall all matters, whether sounding in contract or tort relating to the validity, construction, interpretation and enforcement of this agreement, be determined.

IN WITNESS WHEREOF, the parties hereto have set their hand and seals, or, if corporate, have (has) caused this instrument by their (its) duly authorized officers and their (its) corporate seal(s) hereunto affixed, this _____ day of _____, 19___.

EDGECOMBE SPRAY, INC.

By

_____

(SEAL)

FARMER

By

_____

(SEAL)

_____

WITNESS

_____

WITNESS

APPENDIX B APPLICATOR CONTRACT (EDGECOMBE SPRAY)

STATE OF NORTH CAROLINA
COUNTY OF EDGECOMBE

THIS AGREEMENT, made and entered into this _____ day of _____, 19___, by and between AIR-AG, INC., a North Carolina Corporation, hereinafter referred to as "Applicator," and "EDGECOMBE SPRAY PROGRAM, INC.," hereinafter referred to as "Edgecombe Spray."

WITNESSETH:

THAT WHEREAS, the Applicator has submitted to Edgecombe Spray a proposal for the performance of aerial application, the purpose of which is to provide control of boll weevil and boll worms in cotton; and

WHEREAS, the proposal submitted to the Applicator has been approved and accepted by Edgecombe Spray; and

WHEREAS, the parties hereto desire to reduce the terms of this Agreement to writing;

NOW, THEREFORE, for and in consideration of the mutual promises to each other, and other valuable consideration, as hereinafter set forth, the parties hereto do mutually agree as follows:

1. The Applicator hereby agrees to perform, in a manner satisfactory to Edgecombe Spray, certain technical and professional aerial application service for the application of insecticides and chemicals to crops under the cultivation and control of Edgecombe Spray through the use of aircraft owned and operated by the Applicator, and more specifically agrees to provide such aerial application service in a manner satisfactory to Edgecombe Spray as hereinafter specified.

2. The Applicator agrees to provide ten (10) applications of regular season spray as determined by Edgecombe Spray and in addition thereto, agrees to provide two (2) additional sprays of defoliant mixed with pesticide to _____ acres of the crops designated by Edgecombe Spray.

3. Formulations and schedules of spray will be determined by Edgecombe Spray. The Applicator agrees to apply said insecticides, defoliants, on the hereinabove specified acres as designated by Edgecombe Spray upon a five-day schedule and according to the direction of Edgecombe Spray.

4. Applicator further agrees that in the event the regular schedule is interrupted for any reason, all facilities and personnel of Applicator will be used to fly and apply aerial applications to the hereinabove designated cotton acreage and only upon said acreage until such time as the acreage has been covered and the program and schedule is current.

5. It is further agreed that Edgecombe Spary shall have the option of applying an application with its own equipment or with equipment obtained from any other source in the event it is determined that the Applicator is not performing according to schedule. Provided, however, that if the Insecticide Committee and the Applicator are notified in advance by a written notice three (3) days prior to said action, said application will be deemed one of the regular contracted applications and this contract will be adjusted accordingly.

6. In the event application is delayed and is not on schedule, the Applicator agrees that application will be made according to the directions of Edgecombe Spray.

7. It is further agreed that the Applicator will not provide aerial application of any of the chemicals, insecticides, pesticides or defoliants as provided by Edgecombe Spray upon any acreage not designated by Edgecombe Spray for application.

8. In further consideration of the services provided by the Applicator, Edgecombe Spray hereby agrees to pay to the Applicator for the application of such insecticides, pesticides, chemicals and defoliants according to the following conditions:

A. _____ per acre for each application where the volume of water added to the pesticide or chemical thus applied is sixteen ounces (16 oz.) or less per acre.

B. _____ per acre for each application where the volume of water added to the pesticide or chemical is more than sixteen ounces (16 oz.) but not more than one-half gallon per acre.

C. _____ per acre for each application where the volume of water added to the pesticide or chemical is more than one-half gallon but not more than one gallon per acre.

D. _____ per acre for each application where the volume of water added to the chemical exceeds one gallon per acre.

Edgecombe Spray will pay to the Applicator the consideration as set forth hereinabove, which shall constitute full and complete compensation for the Applicator's services herein. Said consideration will be paid according to the following terms and conditions:

A. Edgecombe Spray will pay to the Applicator the cost as hereinabove provided for one application upon the completion by the Applicator of three (3) applications and upon determination by Edgecombe Spray that said applications are made in a manner satisfactory to Edgecombe Spray.

B. Edgecombe Spray will pay to the Applicator the Compensation as hereinabove provided with the remaining applications upon the completion of each application and upon the determination by Edgecombe Spray that said application was made in a manner satisfactory to Edgecombe Spray.

C. The final payment for the first two applications will be made when it is determined by Edgecombe Spray that the terms of the contract have been satisfactorily fulfilled by the Applicator.

9. The Applicator represents that he has, or will secure at his own expense, all personnel required in performing the services under this Agreement. The Applicator further agrees that Edgecombe Spray will have first call upon the equipment and personnel assigned to make aerial applications for Edgecombe Spray, and that said equipment and personnel will be used to apply pesticides, chemicals, defoliants, as determined by Edgecombe Spray to the crops as designated by Edgecombe Spray until such time as the acreage has been covered in the manner herein specified. The Applicator further agrees that said equipment and personnel will be used solely for purposes of this Agreement and only for the purposes of this Agreement until such time as the purposes have been fulfilled. At said time, the Applicator may utilize its equipment and personnel for other purposes as determined by the Applicator.

10. The Applicator agrees that all personnel and equipment shall be the sole responsibility of the Applicator. Applicator shall not be an employee of or have any agency relationship with Edgecombe Spray. The Applicator further agrees to save and hold harmless Edgecombe Spray for any injury or damages arising out of the duties and services performed by the Applicator.

11. The services of the Applicator are to commence on the _____ day of _____, 19__, and shall be undertaken and completed in such sequence as to assure their expeditious completion in the light of the purposes of this Agreement, but

in any event, all of the services required hereunder shall be completed by the _____ day of _____, 19__.

12. If, through any cause, the Applicator shall fail to fulfill in timely and proper manner their obligations under this Agreement, the Edgecombe Spray shall thereupon have the right to terminate this contract by giving written notice to the Applicator of such termination and specifying the effective date thereof at least five (5) days before the effective date of such termination. It is further provided that Edgecombe Spray may terminate this Agreement at any time by notice in writing from Edgecombe Spray to the Applicator by giving written notice ten (10) days prior to the effective date of such termination.

13. It is further agreed that in the event there is a complete failure of any part or all of the crops, as designated by Edgecombe Spray, Edgecombe Spray may cancel and rescind the contracted commitment for compensation for the failed portion thereof. Notwithstanding, the Applicator shall not be relieved of any liability of Edgecombe Spray for damages sustained by the failure of the Applicator or by virtue of any breach of this Agreement by said Applicator, and Edgecombe Spray may withhold payment to the Applicator for the purpose of setoff until such time as the exact amount of damages due Edgecombe Spray from such failure or breach can be determined.

14. It is agreed between the parties hereto that the place of this contract, its status and forum, shall be Edgecombe County, North Carolina, and in said County and State shall all matters, whether sounding in contract or tort relating to the validity, construction, interpretation and enforcement of this Agreement, be determined.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals, or, if corporate, have caused this instrument by their duly authorized officers and their corporate seals hereunto affixed, this _____ day of _____, 19__.

EDGECOMBE SPRAY, INC.

By

_____

(SEAL)

_____

WITNESS

AIR-AG, INC.

By

_____

(SEAL)

_____

WITNESS

APPENDIX C FIELD REPORT (EDGECOMBE SPRAY)

RT # [1] [a]

COTTON PEST MANAGEMENT PROGRAM GROWER REPORT

Grower _____ # [2] [3] [4]

Date Scouted [5] [6] [7] [8] [9] (Yr / Mo / Day) Scout _____ # [10] [11]

PM Program _____ [12] [13] County _____ [14] [15] [16]

			Boll Weevil				Bollworms											Other							
Field No.			% Damaged Squares		No Live Weevils/ 100 Squares		% Damaged				Live Worms/ 100 squares		No / 100 Terminals					Mites	Aphids	# squares / 10 row ft.			Growth Stage	Node # 1st Square	
							Squares		Bolls				Eggs			Worms									
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

Comments:

MITE & APHID CODES
0—NONE
1—LIGHT
2—MEDIUM
3—HEAVY

GROWTH STAGE CODES
1—PRESQUARE
2—SQUARING
3—BLOOM
4—MATURE BOLLS
5—OPEN BOLLS

N. C. Agricultural Extension Service in cooperation with USDA, APHIS. N. C. Department of Agriculture and N. C. Agricultural Experiment Station.

Project Copy

APPENDIX D ACTIVITY REPORT (EDGECOMBE SPRAY)

Luke Hudson Jr

8.0A

FIELD I.D. 329	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13
DATE SCOUTED	6-30	7-9	7-15	7-23	7-30	8-6	8-11						
DATE SPRAYED	6/25	7/3	7/23	7/25	8/2	8/8	8/12	8/17	8/21	8/28	9/4	9/11	9/28
CHEMICAL USED	C	C	C-3	C-3	C-3 C	C-3 C	C-3	C-3	C-3	C-3	C-3	C	D.S
% BOLLWEEVIL DAMAGE	None	N	N	2%	1 3%		10% 9%						
% BOLLWORM DAMAGE		N		3% 1%	Heavy	5% 2% Eggs	9% 1%						
EXTRA SPRAYINGS	10/14 D.P.												

COMMENTS: None

APPENDIX E GROWER CONTRACT FOR SCOUTING & AERIAL APPLICATIONS (SAFFORD VALLEY)

For a valuable consideration, I hereby authorize SAFFORD VALLEY COTTON GROWERS COOPERATIVE, INC., to deduct from the proceeds of any cotton ginned by it for me, the amount advanced by them for me for field check service on damaging insects, at the rate of _____ per acre. This service will cover the period June 15 through September 15, _____. I further agree that at such time Pink Bollworm population reaches 15 percent, for any field that I will authorize the spraying program for that field, to continue for the balance of the growing season.

For a valuable consideration, I hereby authorize SAFFORD VALLEY COTTON GROWERS COOPERATIVE, INC., to deduct from the proceeds of any cotton ginned by it for me, the amount advanced by them for me for spraying and insecticide requested by me, at the rate of _____ per acre, for 3 gallon spray per acre, and _____ per acre for 5 gallon spray per acre. It is further agreed that should the actual cost be less than the above rates, that the rates per acre will be reduced proportionately.

I further authorize the SAFFORD VALLEY COTTON GROWERS COOPERATIVE, INC., authorized representatives to enter upon the premises farmed or owned by me, to perform field check service and spray program and agree to hold SAFFORD VALLEY COTTON GROWERS COOPERATIVE, INC., and its authorized representatives harmless for any liabilities or damages resulting from performing this service.

_____

GROWER OR LANDOWNER DATE

_____

WITNESS WITNESS

APPENDIX F GROWER CONTRACT FOR SEX LURES (SAFFORD VALLEY)

For a valuable consideration, I hereby authorize SAFFORD VALLEY COTTON GROWERS COOPERATIVE, INC., to deduct from proceeds of any cotton ginned by it for me, the amount advanced by them for me for placement of Gossuip Lures (Sex Lure) in my fields. These lures will cost not more than $_____ per acre, based on certified acres. This money to be deducted on the 19___ - 19___ crop.

_____

GROWER OR LANDOWNER DATE

_____

WITNESS WITNESS

APPENDIX G FIELD REPORT (SAFFORD VALLEY)

COTTON
COOPERATIVE PEST MANAGEMENT PROGRAM

Arizona Pest Management, Inc.
P.O. Box 12
Safford, Arizona 85546
Mike Pursley Ph. 428-1823

OWNER _____

DATE _____ SAMPLER _____

			FIELD NUMBER						SUGGESTED U OF A TREATMENT LEVEL
	Time: To nearest hour								
Number per 100 plants examined	Pink Bollworm	Damaged Balls							15 infested bolls/100
		Larvae Small							
		Larvae Large							
	Bollworm	Larvae							10-12 larvae/100 plants
		Eggs							
		Damaged Squares							
	Leaf Perforator	Leaves							25 infested leaves/100
	Cabbage Looper	Leaves							
	Other								
Number per 100 net sweeps	Lygus	Damaged Squares							25 damaged squares/100 or 15-20 lygus/100 sweeps
		Adults							
		Nymphs							
	Other								COMMENTS:
	BENEFICIAL								
	Lady Beetle	Adult							
	Collops	Adult							
	Orius	Immature							
		Adult							
	Big Eyed Bug	Immature							
		Adult							
	Nabid	Immature							
		Adult							
	Lacewing	Immature							OFFICE COPY
		Adult							

APPENDIX H EXTENSION REPORT (SAFFORD VALLEY)

COOPERATIVE EXTENSION WORK
IN
AGRICULTURE AND HOME ECONOMICS
SAFFORD, ARIZONA 85546

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE
U.S. DEPARTMENT OF AGRICULTURE
AND GRAHAM COUNTY COOPERATING

AGRICULTURE
HOME ECONOMICS
4-H YOUTH DEVELOPMENT
RESOURCE
DEVELOPMENT

ARIZONA PEST MANAGEMENT

August 1, 1975

AREA A (East of Safford)

Lygus—slight increase in nymphal counts. Damaged square counts still very low.
Bollworm -- very few live larvae found.
Pink Bollworm—checking bolls in almost all fields. Counts remaining low.

AREA B (Safford to Thatcher)

Lygus—very slight increase this past week. Counts still quite low.
Bollworm—very few live larvae found.
Pink Bollworm—checking bolls in most fields; blooms in the rest. Populations still very light (less than 5 percent).

AREA C (Thatcher to Pima)

Lygus—counts about the same as last week. Damage negligible.
Bollworm—no increase this past week.
Pink Bollworm—checking blooms or bolls in all fields. Populations still very scattered and light.

AREA D (West of Pima)

Lygus—light populations of both adults and nymphs found throughout the area. Damaged square counts remaining quite low.
Bollworm—slight increase, but still very few found.
Pink Bollworm—checking blooms in all fields and bolls in the more mature fields. Populations still very scattered and light.

Sincerely,

Ronald E. Cluff
County Extension Director

☆ U.S. GOVERNMENT PRINTING OFFICE : 1977 0-241-436/FCS-55

REFERENCE MATERIALS

More detailed information on particular aspects of cooperative organizations, operation, and services is contained in other publications of the Farmer Cooperative Service listed below.

Sample Legal Documents. Part I. Legal Phases of Farmer Cooperatives, Morrison Neely. Information 100. 1976. 39 pp.

Advising People About Cooperatives. C. H. Kirkman, Jr. and Paul O. Mohn. PA-1147. 1976. 20 pp.

How to Start a Cooperative. Educational Circular 18. Revised 1972. 18 pp.

Basic Cooperative Features, Joseph G. Knapp. Bulletin Reprint 3. Revised 1965. 11 pp.

What Are Patronage Refunds? Kelsey B. Gardner. Information 34. 1963. 15 pp.

Single copies of these publications may be obtained by writing to Farmer Cooperative Service, Rm. 550, GHI Building, U.S. Department of Agriculture, Washington, D.C. 20250.

FARMER COOPERATIVE SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Farmer Cooperative Service provides research, management, and educational assistance to cooperatives to strengthen the economic position of farmers and other rural residents. It works directly with cooperative leaders and Federal and State agencies to improve organization, leadership, and operation of cooperatives and to give guidance to further development.

The Service (1) helps farmers and other rural residents obtain supplies and services at lower cost and to get better prices for products they sell; (2) advises rural residents on developing existing resources through cooperative action to enhance rural living; (3) helps cooperatives improve services and operating efficiency; (4) informs members, directors, employees, and the public on how cooperatives work and benefit their members and their communities; and (5) encourages international cooperative programs.

The Service publishes research and educational materials and issues *Farmer Cooperatives*. All programs and activities are conducted on a nondiscriminatory basis, without regard to race, creed, color, sex, or national origin.